THE GENUS *CONOTRACHELUS* (COLEOPTERA, CURCULIONIDAE) IN THE NORTH CENTRAL UNITED STATES

BY

HERBERT FREDERICK SCHOOF

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AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ENTOMOLOGY IN THE GRADUATE SCHOOL OF THE UNIVERSITY OF ILLINOIS, 1940

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THE GENUS *CONOTRACHELUS* (COLEOPTERA, CURCULIONIDAE) IN THE NORTH CENTRAL UNITED STATES

The genus *Conotrachelus* embraces over 427 known species, all of which are confined to the Americas. The majority of these species occur in South and Central America, fifty-four species being present in the United States and Canada. In spite of the relatively large number of species in this region, however, little taxonomical or morphological work has been done on the genus, other than that included in general considerations of the Rhynchophora. Biological data have been accumulated on many of the species, but the significance of these data is questionable because of specific confusion. Consequently, a taxonomic revision of the genus would seem to be of definite value.

The principal characters used in the past for specific distinction have been based on the sculpture of the body regions and their appendages, vestiture, and the relative size of the beak. The evaluation of these characters shows that several, such as the relative size of the beak and the interruptions of the elytral carinae, fluctuate too greatly within certain species to be of taxonomic use. The uncus, mesoscutellum, and metasternal grooves are new characters found to be of value in classification. For sex determination the presence of an additional tergum in the male will separate the sexes in all of the species studied. In addition, the males of many species, in contrast to the females, have dentate metaunci, metasternal grooves, carinate first and second elytral intervals, and a relatively shorter beak. Species difficult to separate by characters common to both sexes have been distinguished by considering the sexes individually.

The male genitalia have been shown to be of definite taxonomic value. They consist of two connecting membranes, spiculum gastrale, phallobase and its appendages, aedeagus and its appendages, and the endophallus. Of these structures only the aedeagus and the endophallus are of importance. The endophallus, through ob-

servation of the transfer apparatus, may be utilized for group differentiation and in a few cases for specific identity. The heavily sclerotized aedeagus is of distinct value in the identification of both species and groups of species. Typically it consists of two heavily sclerotized lateral plates which extend both dorsally and ventrally and are separated dorsally and ventrally by median, membranous or lightly sclerotized areas. The shape of the aedeagus both dorsally and laterally, the presence and extent of an apical process, and the presence and shape of a dorsal, median plate or membrane are the characteristics of the aedeagus significant in classification. It appears from this study that, excepting those morphological characters upon which Groups I-IV are based, the aedeagi are truer indicators of specific relationships than the external morphological characters. Thus, in Group I the aedeagus of *falli* Blatch. clearly shows that this species belongs in the group with *nenuphar* (Hbst.) and *elegans* (Say) even though its elytral and prothoracic sculpture is greatly different from that of either of these species. In Group III *tuberosus* Lec. has the elytral carinae similar to those of *nenuphar* (Hbst.) in Group I, yet its aedeagus distinctly shows that it is closely related to the other species of Group III and not to *nenuphar* (Hbst.). The close affinity of *fissunguis* Lec. and *erinaceus* Lec. is evidenced by similarities in their aedeagi even though externally the two species are very distinct. The aedeagi in the above instances indicate that the basic characters upon which the groups are erected are valid and do not fluctuate as do other previously mentioned "superficial" characters.

The genus *Conotrachelus* is accredited to Dejean in 1835, although subsequent writers have designated either Schönherr (1837) or Latreille (1835) as the author of the name. Those workers who have mentioned Dejean's designation consider it a *nomen nudum*. Dejean, however, first used the name *Conotrachelus* and two of the seventy-one species listed by him, *concentricus* (Oliv.) and *irroratus* (Fab.), are valid species. The remainder, being without descriptions and without valid bibliographic citations, are *nomina nuda*.

In the North Central States twenty-seven species of *Conotrachelus* occur, five of which are here described as new. The

species are separated into four groups instead of the six erected by former workers. They are grouped for convenience in classification and to show phylogenetic relationships more clearly. A key to the groups of *Conotracheli* is given as well as individual keys to the species of the different groups. All the older species have been redescribed, and the phylogeny, nomenclature, and distribution of each considered. Illustrations of the aedeagi of all species and of other important taxonomic characters have been included. Neotypes and neoparatypes have been erected for those species whose types have been destroyed.

SYNOPSIS OF THE GROUPS OF *CONOTRACHELI*

Group I

Tarsal claws divergent and toothed; prothorax without a median sulcus; femora bidentate, proximal tooth obliterated in the males of *tibialis* n. sp. and distal tooth evanscent in *nivosus* Lec.; first and second funicular segments of antennae subequal in length and each longer than any of the succeeding segments; prothorax densely punctate, carina present or absent; metaunci in male frequently dentate; metasternum frequently grooved in males; third elytral interval carinate with costa twice interrupted (except in *falli* Blatch.); fifth and seventh intervals carinate, costae either complete or interrupted; ninth interval with a complete carina which does not attain the humerus (except in *seniculus* Lec.); vestiture usually of elongate recumbent setae, setae usually condensed postmedianly to form a fascia, usually without erect setae on the elytral intervals; aedeagus with a dorsal plate, transfer apparatus (except in *nivosus* Lec. and *seniculus* Lec.) consisting of two roughly rectangular plates.

Group II

Tarsal claws divergent and toothed; prothorax without a median sulcus; femora unidentate (faint indication of a second denticle in *cribricollis* (Say)); relative length of first and second funicular segments of antennae variable; males never with metasternal

grooves but frequently with dentate metaunci; elytral intervals three, five, seven, and nine, either acutely carinate or feebly convex, carinae usually complete, that of the seventh interval attaining the humerus; vestiture usually of recumbent setae, occasionally of scales or scale-like setae, suberect to erect setae sometimes present on elytral intervals and in prothoracic punctures, setae never condensed in a broad postmedian band; aedeagus with a dorsal membrane (except *crataegi* Walsh), usually with an apical process, transfer apparatus a complex of sclerotized bars.

Group III

Tarsal claws divergent and toothed; prothorax with a median sulcus; femora bidentate, distal denticle minute; beak subequal to or shorter than prothorax; antennae with first funicular segment either subequal to or longer than the second, each longer than any of the succeeding segments; prothorax densely punctuate with two lines of white or yellowish pubescence on each side; intervals three, five, seven, and nine costate; costa of fifth interval always interrupted basally; vestiture of recumbent setae; abdomen coarsely punctate; aedeagus elongate with a dorsal membrane and a distinct apical process, transfer apparatus a complex of sclerotized bars.

Group IV

Tarsal claws approximate and cleft; prothorax not sulcate; femora unidentate; first two funicular segments of antennae subequal in length and each longer than any of the others; prothorax coarsely and densely punctate, with suberect or erect setae; elytral intervals not carinate and with rows of suberect setae; aedeagus elongate, depressed apically, with a dorsal membrane and a distinct apical process, transfer apparatus a complex of sclerotized bars.

Checklist of the Species of the North Central States

Group I

1. *juglandis* Lec.
2. *buchanani* n. sp.
3. *nenuphar* (Hbst.)
   argula (Fab.)
   cerasi (Peck)
4. *albicinctus* Lec.
5. *iowensis* n. sp.
6. *retentus* (Say)
7. *affinis* Boh.
8. *hicoriensis* n. sp.
9. *falli* Blatch.
10. *nivosus* Lec.
    plagiatus Lec.
11. *seniculus* Lec.
12. *elegans* (Say)
13. *hayesi* n. sp.
14. *tibialis* n. sp.
15. *aratus* (Germ.)

Group II

16. *crataegi* Walsh
17. *adspersus* Lec.
18. *naso* Lec.
19. *posticatus* Boh.
20. *recessus* (Csy.)
    atokanus Fall
21. *geminatus* Lec.
22. *cribricollis* (Say)
    puncticollis Walsh

Group III

23. *tuberosus* Lec.
24. *anaglypticus* (Say)
    rubiginosus Boh.
25. *leucophaeatus* Fahr.
    demens Boh.

Group IV

26. *fissunguis* Lec.
27. *erinaceus* Lec.

VITA

Herbert Frederick Schoof was born April 18, 1914, in Corona, Long Island, New York. His grammar school training was obtained in the New York and New Jersey School systems. In June, 1932, he graduated from the Ridgewood High School, Ridgewood, New Jersey, and the following September enrolled in the North Carolina State College, Raleigh, North Carolina. During the month of August, 1935, he was employed by the Bureau of Entomology and Plant Quarantine as a field aide in a tobacco insect survey of North Carolina, South Carolina, and Virginia. In the fall of 1935 he was senior assistant in Zoology at North Carolina State College and was in charge of a laboratory section of General Zoology. He received a Bachelor of Science degree in Entomology with honors in June, 1936. The summers of 1936 to 1938 were spent in the employment of the North Carolina Agricultural Experiment Station as a research assistant to Dr. Z. P. Metcalf. In the school years 1936-37 and 1937-38, while working toward a Master of Science degree at the North Carolina State College, he held a teaching fellowship in the Department of Entomology and Zoology. During these periods he was in charge of laboratories in General Zoology, Economic Zoology, Economic Entomology, Forest Entomology, and Genetics. After completing his studies on the effects of various relative humidities on the life processes of the southern cowpea weevil, *Callosobruchus maculatus* (Fabr.), he received a Master of Science degree in Entomology in June, 1938. The school years 1938-39 and 1939-40 were spent at the University of Illinois where he held an assistantship in the Department of Entomology.

He is a member of Phi Kappa Phi, Sigma Pi Alpha, and Phi Sigma, and an associate member of Sigma Xi. He is also affiliated with the Entomological Society of America, The American Association of Economic Entomologists, The American Association for the Advancement of Science and The Ecological Society of America.